

An aerial photograph of the Oroville Dam and its reservoir. The dam is a large concrete structure spanning a river. The reservoir is a large body of blue water. The surrounding landscape is a mix of dry, brownish-yellow hills and green, forested areas. A winding road is visible on the left side of the image. The text is overlaid on the upper right portion of the image.

Oroville FERC Relicensing (Project No. 2100)

Environmental Work Group

January 28, 2004

SP-F10 Task 2D Interim Report



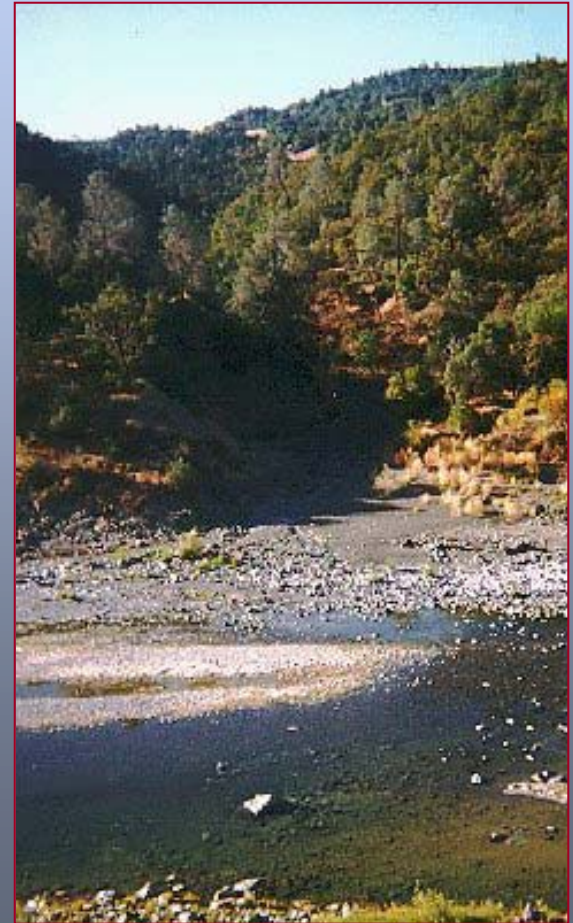
Evaluation of Flow Fluctuation Effects on Chinook Salmon Redd Dewatering in the Lower Feather River

SP-F10 Task 2D Interim Report



Study Objective

- ◆ **The objective of SP-F10 Task 2D is to evaluate the potential for, and the impact from, the dewatering of Chinook salmon redds due to flow fluctuations in the lower Feather River.**



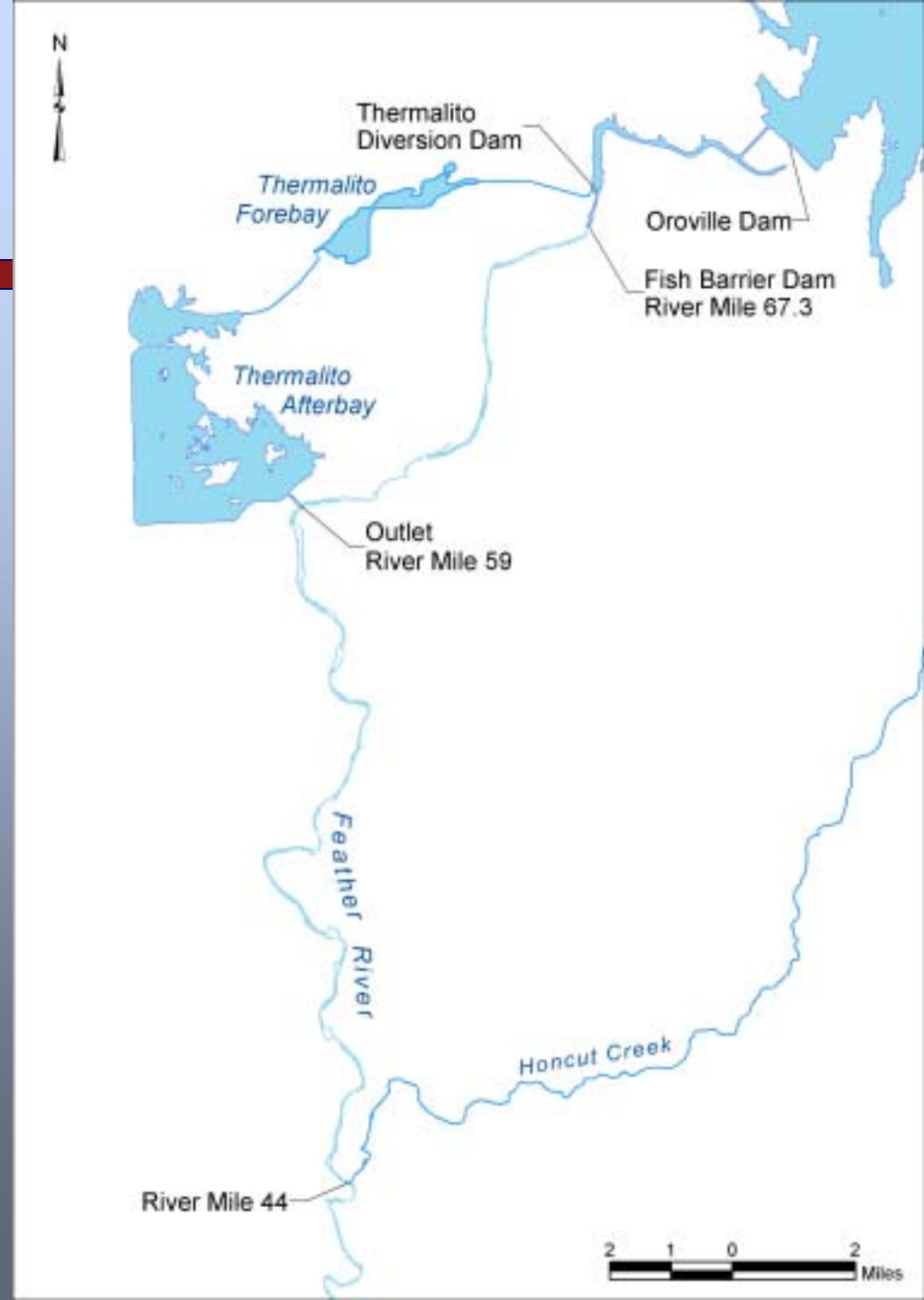
Need for Study

- ◆ **The Oroville Facilities affect instream flow and water surface elevation, thereby influencing the potential for Chinook salmon redd dewatering in the lower Feather River.**

Introduction

Study Area

- ◆ Feather River from the Fish Barrier Dam to the confluence with Honcut Creek
 - ◆ Detailed analysis on flow fluctuations in the HFC



Introduction

Operational Constraints

- ◆ **Downstream Operation**
 - ◆ **Instream flow requirements**



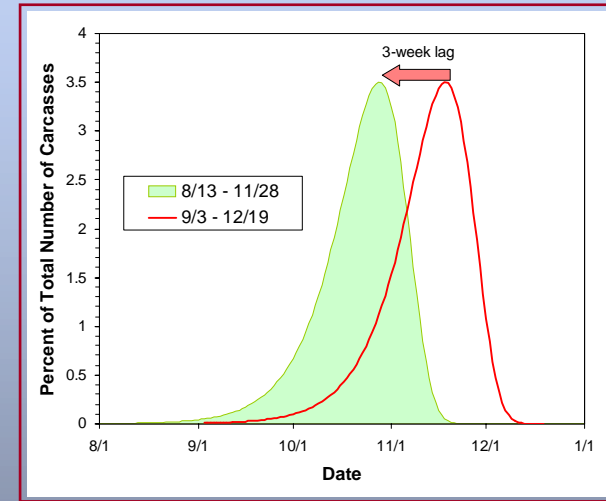
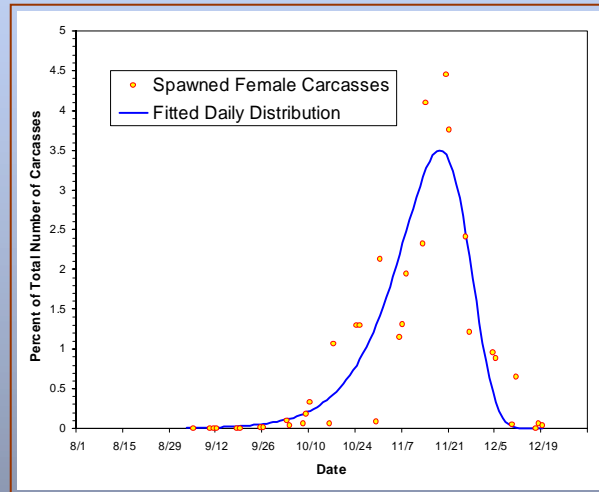
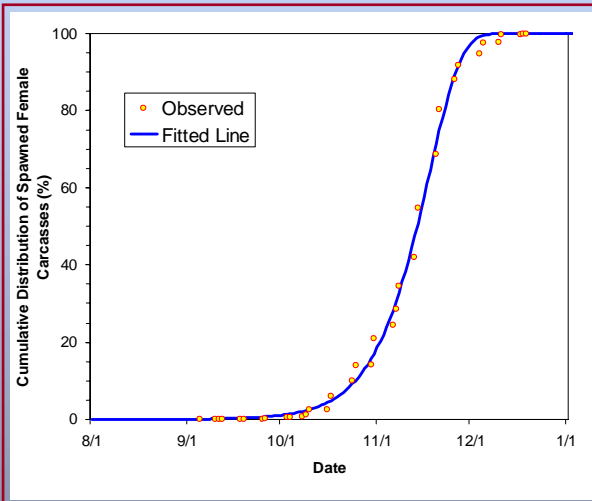
Methodology

Analytical Procedures

- ◆ Estimation of the number of redds constructed each day throughout the spawning season
- ◆ Estimation of the duration of individual redd incubation periods
- ◆ Estimation of the redd depth distribution in the HFC
- ◆ Calculation of the maximum reduction in river stage that occurred during each individual redd incubation period;
- ◆ Calculation of the percentage of the total number of redds dewatered in the HFC during the 2002/2003 Chinook salmon spawning and incubation period
- ◆ Estimation of the overall percentage of Chinook salmon redds dewatered in the entire lower Feather River

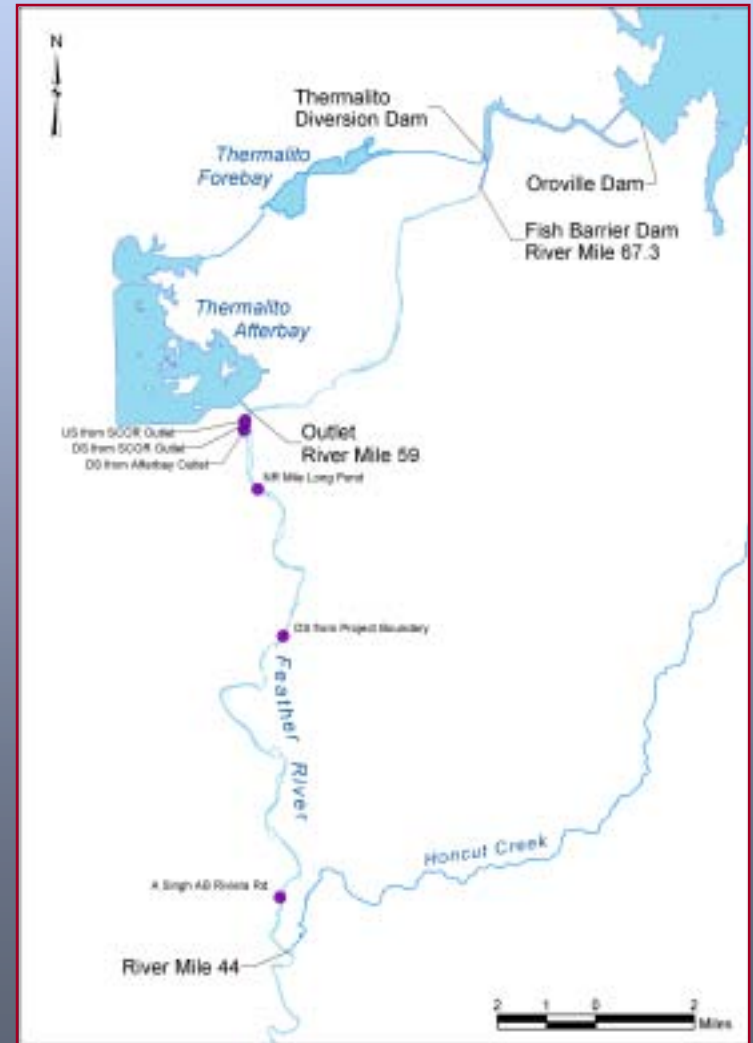
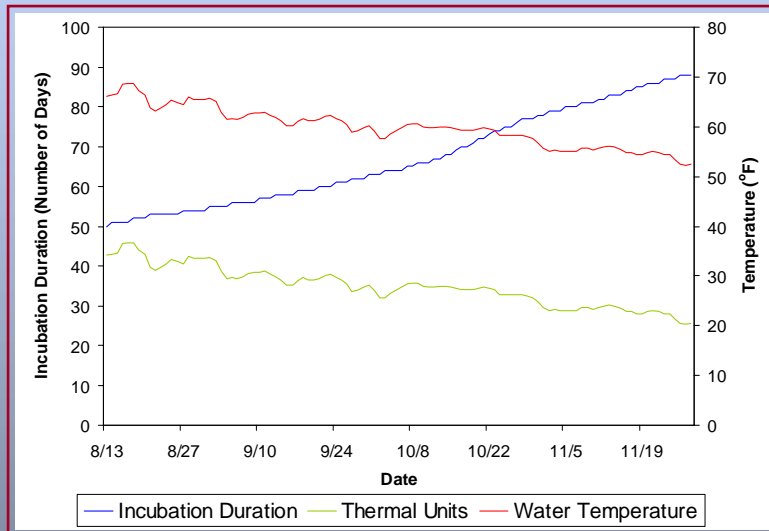
Methodology : Analytical procedures

Estimation of the number of redds constructed each day throughout the spawning season



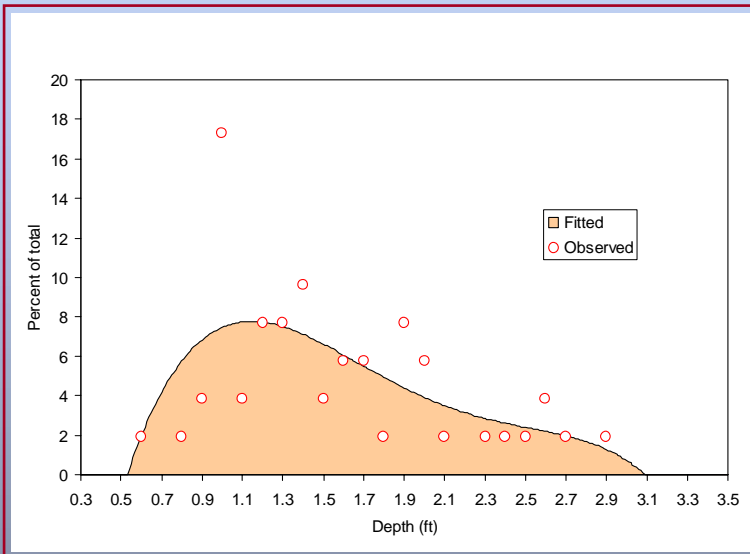
Methodology : Analytical procedures

Estimate the duration of individual redd incubation periods

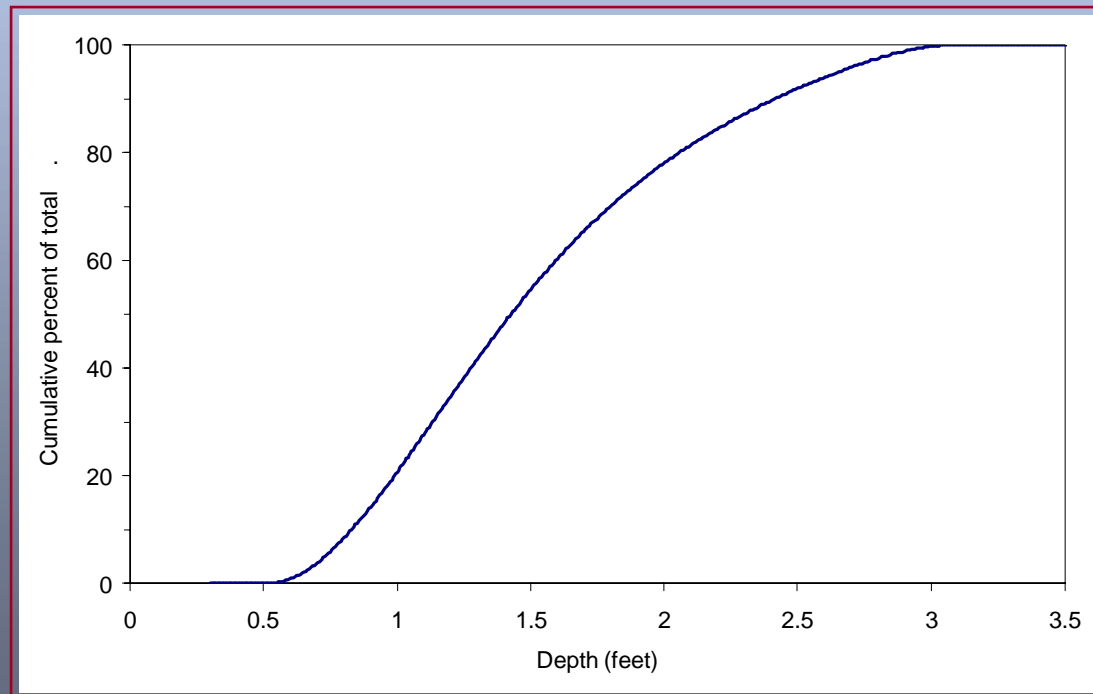


Methodology : Analytical procedures

Estimate redd depth distribution



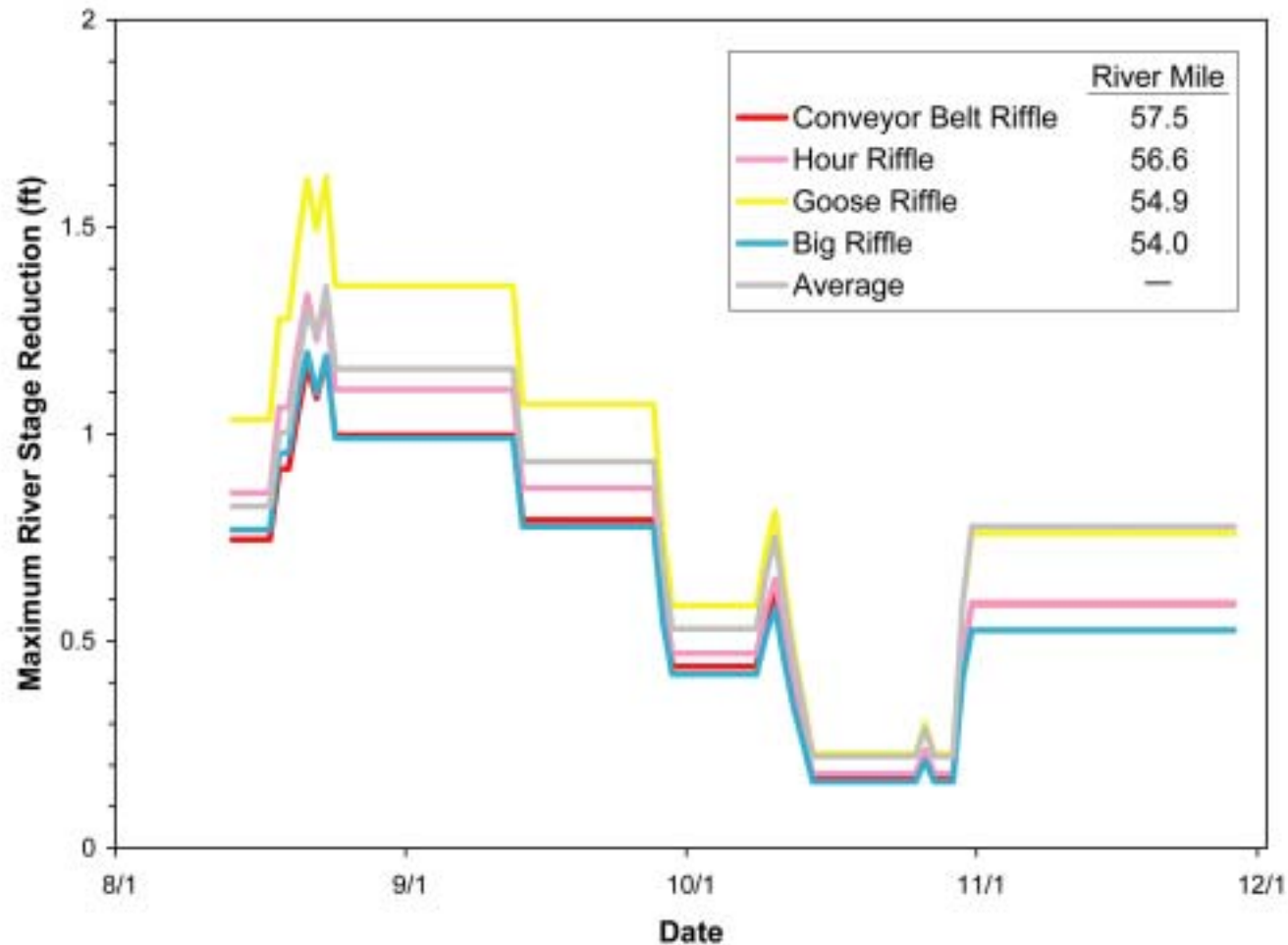
Chinook salmon redd depth distribution in the High Flow Channel (HFC) of the lower Feather River, 1991 (DWR data).



Chinook salmon redd depth cumulative distribution.

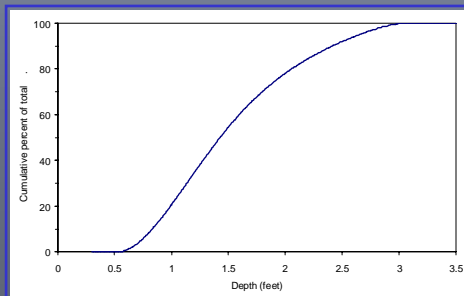
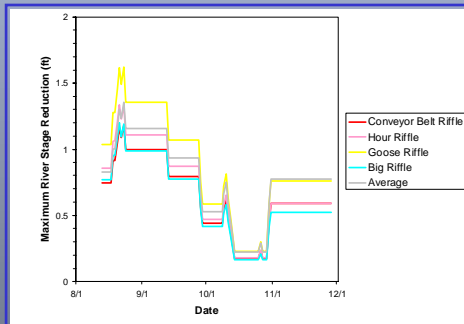
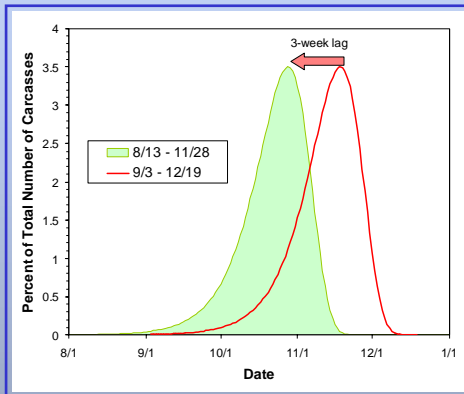
Methodology : Analytical procedures

Calculate the maximum reduction in HFC river stage that occurred during each individual redd incubation period



Methodology : Analytical procedures

Calculate the % of the total number of redds dewatered in the HFC during spawning and incubation period



1. % of redds built per date;
2. Maximum stage reduction per incubation period per redd/date;
3. % of redds at depths shallower than Max Stage reduction; and
4. (Step 1) x (Step 3) = % of redds dewatered that were built on a particular date;
5. Repeat steps 1 through 4 for each date of the spawning season, and sum the resulting daily percentages of dewatered redds to obtain the total percentage of redds dewatered in the HFC.

Methodology : Analytical procedures

Estimate overall percentage of Chinook salmon redds dewatered in the entire lower Feather River.

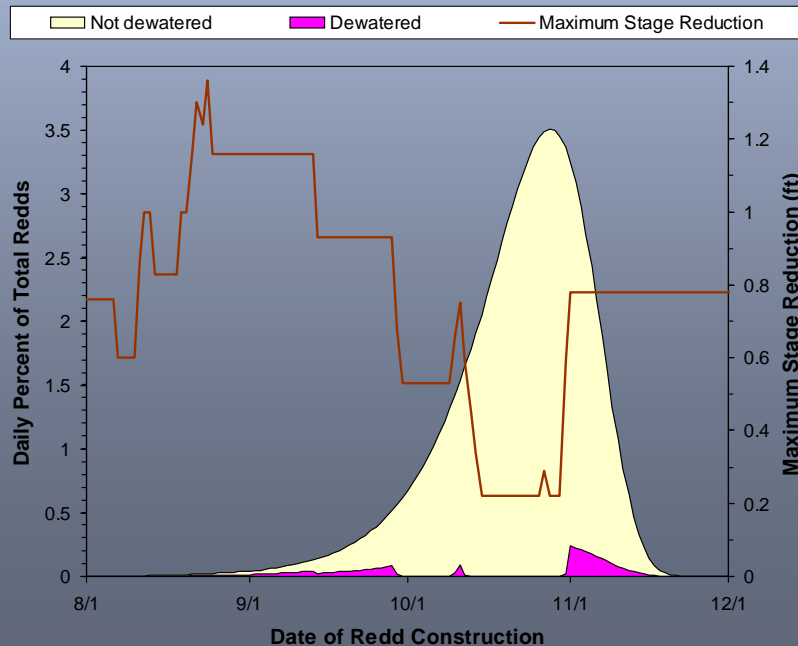
- ◆ Total number of fish in spawning population
- ◆ Number of adult fish in the LFC and HFC
- ◆ Number of females in the LFC and HFC (55.9% Female)
- ◆ Number of “spawned” females (Varied Weekly)
- ◆ Number of redds in the LFC and HFC (1 redd per female)
- ◆ Percentage of redds dewatered in the LFC and HFC
- ◆ Percentage of Chinook salmon redds dewatered in the entire lower Feather River

Week	% Females Spawned
1	4.6
2	2.6
3	2.4
4	4.2
5	27.8
6	58.6
7	59.4
8	72.0
9	75.3
10	80.6
11	89.9
12	88.7
13	85.3
14	81.3
15	80.0

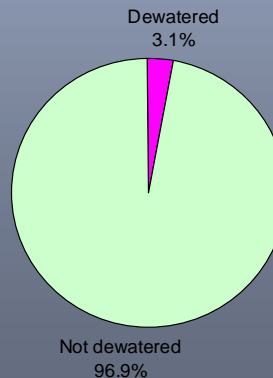
Results

Estimated percentage of Chinook salmon redds dewatered in HFC

- ◆ Spawning through emergence period (August 13, 2002 through February 24, 2003)
- ◆ Results using average stage-discharge relationships (3.1% of redds in HFC potentially dewatered)



Percent of Total HFC Redds



Individual Riffles

Conveyor Belt	0.76%
Hour	1.10%
Goose	3.60%
Big	0.60%

Results

Estimated number of Chinook salmon redds constructed in the lower Feather River

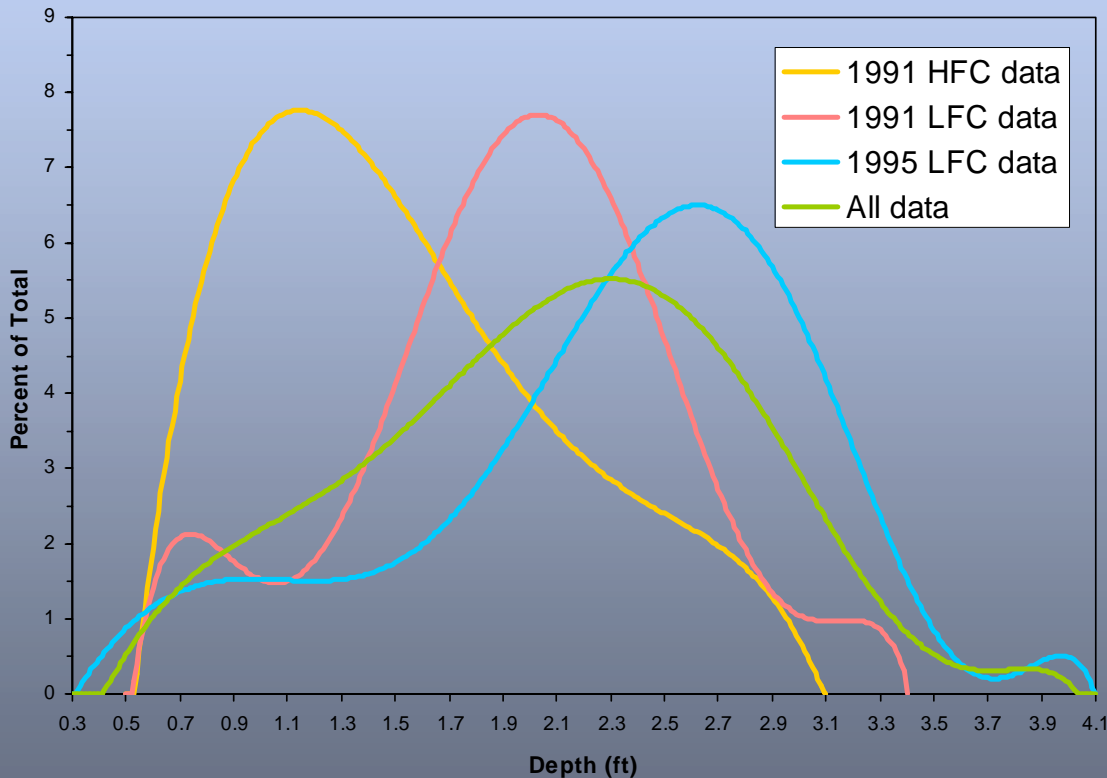
- ♦ **An estimated 23,563 Chinook salmon redds were built in the LFC in 2002 (63.6% of all redds).**
- ♦ **An estimated 13,489 Chinook salmon redds were built in the HFC in 2002 (36.4% of total redds).**

Results

Estimated number of Chinook salmon redds constructed in the lower Feather River

- ♦ **LFC – 0% of all redds dewatered**
- ♦ **HFC – 3.1% of all redds dewatered**
- ♦ **Entire Lower Feather River – 1.1% (i.e., $[(0.636 \times 0) + (0.364 \times 0.0311)] \times 100 = 1.1\%$) of all redds dewatered during the 2002/2003 Chinook salmon spawning and incubation period**

Analyses



- ◆ **1991 HFC data**
- ◆ **1991 LFC Data**
- ◆ **1995 LFC Data**
- ◆ **All data**